# FOREST RESEARCH NOTES

NORTHEASTERN FOREST EXPERIMENT STATION

Upper Darby, Pennsylvania

No. 43
1955

## Relationship Of Stump Diameter To D.b.h. For American Beech In The Northeast

This is the third report on a series of studies (2, 3) made to show the relationship of stump diameter to diameter breast high (d.b.h.) for commercially important tree species in the Northeast. This report is for American beech (Fagus grandifolia).

In this study 554 stump-diameter measurements were used, ranging from 4 inches to 41 inches. Both stump diameters and d.b.h. were measured to the nearest 1/10 inch with a diameter tape. To obtain diameter inside bark, bark thickness was measured with a Swedish bark gage. Stump heights were measured on the uphill side to the nearest 1/10 foot.

It was found that 71 percent of the stumps left on logging operations were between 0.6 and 1.8 feet high; 25 percent were higher than 1.8 feet; and only 4 percent were lower than 0.6 foot. Butt rot--rather than under-utilization --accounted for 26 percent of the stumps cut over 1.8 feet high.

In the computations, inside-bark stump diameters were used, to avoid inaccuracies due to unequal bark thickness, logging damage to bark, and bark peeling off. Stump diameters were sorted into 2-inch classes. Stump-height measurements were sorted into 0.6-foot classes within each stump-diameter class.

To develop an equation expressing the stump diameter-d.b.h. relationship for American beech, the method described by Deming (1) was used. The following equation was obtained:

D.b.h. = 0.686 (stump d.i.b.) + 1.711 (stump height) - 0.220

The relationships developed from this equation were worked out as a graph (fig. 1).

To determine the 2-inch d.b.h. class of a beech stump from this graph, you merely plot the intersection of the vertical ordinate (stump height) with the horizontal ordinate (stump diameter). For example, for a stump 19.9 inches in diameter and 1.4 feet high, the two lines intersect about halfway between the two limits of the 16-inch d.b.h. class.

Comparison of actual d.b.h.'s and those calculated with the equation showed an average weighted difference of less than 0.7 inch. The standard error of estimate for all data was 1.231 inch. At the mean of stump diameters, you can expect 59 percent of the estimates of d.b.h. to fall in the correct 2-inch d.b.h. class. Another 31 percent can be expected to fall one class above or below the correct one; and 10 percent will fall outside this range. These errors are compensating. As the stump diameters increase beyond the mean of these data, the error will also increase.

(If you use the graph by 1-inch d.b.h. classes, this is what you can expect: 32 percent of the estimates should fall in the correct 1-inch d.b.h. class; 46 percent should fall one class above or below it; and 22 percent should fall outside this range.)

For all practical purposes, the graph is expected to give reliable d.b.h. estimates for American beech anywhere in the Northeast.

---

Literature References

(1) Deming, W. Edwards.
1938. Statistical adjustment of data. 261 pp., illus. Wiley & Sons, New York.

(2) Hampf, Frederick E.
1954. Relationship of stump diameter to d.b.h. for white pine in the Northeast. U.S. Forest Serv. Northeast. Forest Expt. Sta., Forest Res. Note 38. 4 pp., illus.

(3) ---------
1955. Relationship of stump diameter to d.b.h. for sugar maple in the Northeast. U.S. Forest Serv. Northeast. Forest Expt. Sta., Forest Res. Note 42. 3 pp., illus.

--FREDERICK E. HAMPF

Forest Economist
Division of Forest Economics
Northeastern Forest Experiment Station

Agriculture-Forest Service-Upper Darby

# STUMP DIAMETER – D.B.H. RELATIONSHIP FOR AMERICAN BEECH IN THE NORTHEAST

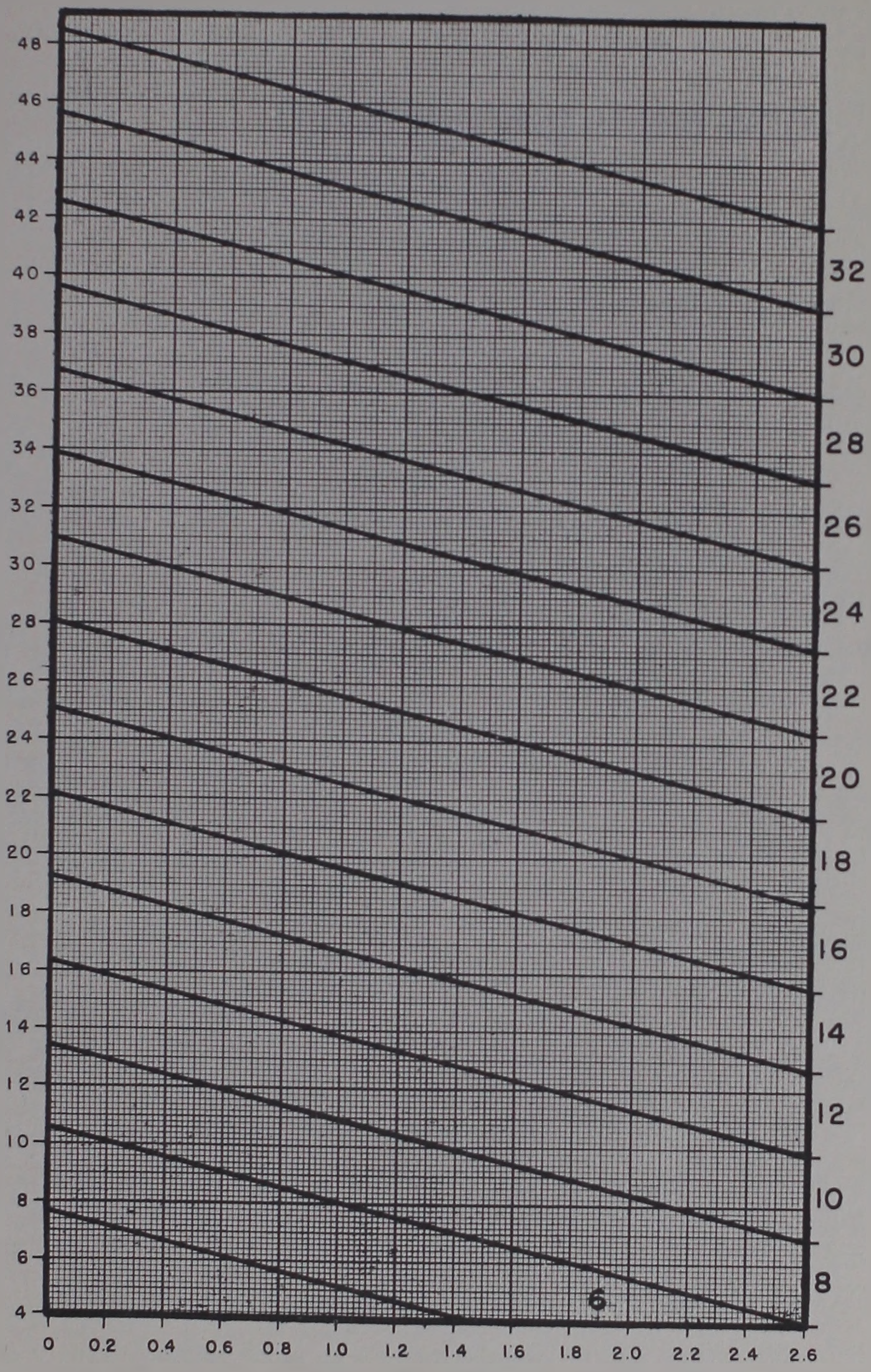


Figure 1